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## IN REGARD TO COLOR-BLINDNESS AMONG INDIANS.

BY L. I. BLAKE AND W. S. FRANKLIN, STATE UNIVERSITY.

The fact that blindness to certain colors exists among civilized people, is well established; also, the percentage of cases to be found among males has been determined with considerable probability for the races of Europe and America. There has been much diversity in methods of testing, and the results of many reported determinations might well be called into question. Still, it is probably not far from the truth that four out of every hundred males are more or less deficient in color-sense. Of females, there have been reported (B. J. Jeffries, M. D., "Color-Blindness," p. 74), as examined in Europe and America, 39,828, and of these only 60 were color-blind, or 2 per cent. Of both males and females, 156,732 have been tested, and of these, 6,721, or 4.27 per cent., are color-blind. These statistical facts have naturally excited interest and discussion. If so large a number as four out of every hundred are unable to distinguish colors, there arises, of course, a practical question, important to the railroads, marine, etc.

The gravity of this fact is already recognized more or less in all countries, by the test examinations for color-blindness among employés. But there is in these statistics also much of interest to scientists.

Most cases of color-blindness are found to be congenital, and are incurable. Many have been produced by disease, some by violent concussions in accidents, and some by excessive use of tobacco and alcohol. Temporary blindness to violet may be induced by santonine. From these facts several interesting questions have suggested themselves to us. If color-blindness follows the laws of heredity, is it on the increase, or decrease? Further, is it a product of civilization? The first of these queries can be answered only by statistical data extending over long periods of time. The second naturally suggests a comparison: first, of the color-sense of civilized nations among themselves; and second, of civilized with uncivilized peoples.

Of tests on native tribes, we can find but two recorded—those of Dr. Favre on some tribes in Algiers, and those of Dr. Fox on 150 American Indians, but where we do not know.

First, for the comparison of civilized tribes among themselves, we have calculated the following percentages from tables reported by Dr. Jeffries:

COUNTRIES.	No. examined.	Per cent. color-blind.
Austria.....	5,250	3.79
Denmark.....	5,840	3.74
Belgium.....	8,106	4.13
Holland.....	2,300	1.43
Finland.....	1,200	5.00
Norway.....	205	4.88
Sweden.....	32,504	3.73
Switzerland.....	3,024	5.36
Germany.....	6,344	4.12
Russia.....	12,830	3.30
Italy.....	2,065	2.32
England.....	16,431	3.75
United States.....	44,844	3.64
Average per cent.....		3.76

No great reliance can be placed upon these results. The numbers examined are too small, the methods of testing not uniform, not equally reliable. However, the probabilities of error are about equally distributed; so that the conclusion is fairly

well established, even without great accuracy of data, that among civilized nations color-blindness is at present almost equally common.

Second, among uncivilized people, Dr. Favre's results from Algiers, already alluded to, show 414 examined, and only 2.6 per cent. color-blind.

Dr. Fox reports 161 young Indians tested, and only 1.81 per cent. color-blind.

These percentages, so low compared with those for civilized people, suggested to us that color-blindness may be a product of civilization, and have led to our tests here reported.

At the Haskell Institute, at Lawrence, Kansas, are several hundred Indians, representing many tribes. These we have recently examined by Holmgren's method with Berlin worsteds. Out of 418 tested—285 males and 133 females—only three cases of color-blindness exist, or only .7 of one per cent. These three are full-blooded Indians of the Pottawatomie, Pawnee and Crow tribes. Of these, two have defective color-sense for red and one for green.

The Indians of the School are about equally divided as full-bloods and half-breeds. It seemed to us that the half-breeds showed more instances of blunted color-sense than the full-bloods. This was evidenced in more frequent and prolonged hesitation among them in comparing the colors than among the full-bloods.

If this be confirmed by more extended examinations, it would, in conjunction with the low percentages obtained as above, be an argument on the theory proposed by us, that defective color-vision is in some way the product of civilization.

The use of tobacco suggests itself as a possible cause. This would explain also the low percentage among females. It leads also to the thought of increase of color-blindness in males in future generations. But the data are at present too meager to more than suggest this explanation.

It is certainly not accidental that nearly every case of color-blindness is for red, few for green, and seldom one for violet. Why are the defects thus limited, at present at least, to the longer wave-lengths of light?

The Young-Helmholtz theory of color-perception will locate the affection in that layer of the retina corresponding to the first of the three primary sensations of color. But why this special layer, with few exceptions, is the only one affected, has at present no explanation.

The law of heredity indicates increasing sensitiveness in those nerves which are subjected to special use through many generations. It seems reasonable that this must lead to a more perfect color-sense in females; but among males there will probably be an increase, in future generations, of the number of cases of defective color-sense.

PHYSICAL LABORATORY, November 1, 1888.

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#### STATISTICS ON COLOR-BLINDNESS AMONG THE STUDENTS AT THE STATE AGRICULTURAL COLLEGE.

BY C. M. BREESE,

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The test used in conducting this experiment was that known as the Holmgren method. The operator had tumbled a great number of small pieces of yarn of all the various colors and shades obtainable, in one pile. These we will term the yarns of confusion. A yarn of a pure, light-green color was given the person to be examined, and he was asked to select from the colors of confusion several pieces of yarn